

## Comparison of Gill Nets and Jug Lines for Selectively Harvesting Large Gar

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*Abstract:* The effectiveness of gill nets and jug lines were evaluated for selectively harvesting large alligator gar (*Lepisosteus spatula*) and longnose gar (*L. osseus*) in Sam Rayburn Reservoir, Texas. Gill nets with bar-mesh sizes ranging from 5.08 to 15.24 cm and jug lines were fished during September and October 1986. Catch per unit of effort (CPUE) in number of fish per man-hour, lengths of gar captured, and relative selectivity by gear were compared. Average effort required to fish 1 gill net or 10 jug lines overnight was 1 man-hour. CPUE of both gar species was significantly greater by jug lines than by gill nets. Jug lines were more selective for gar than gill nets.

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Anglers and business operators on Sam Rayburn Reservoir expressed concern that predation by large alligator gar (*Lepisosteus spatula*) and longnose gar (*L. osseus*) were a threat to sportfish populations. Although this did not appear to have any biological validity (Seidensticker 1987), this group advocated legalization of commercial gill netting for gar removal. Commercial netting had been eliminated at Sam Rayburn Reservoir in 1978 in response to the introduction of striped bass. Since gar are now harvested commercially with jug lines, this study was conducted to compare the effectiveness of gill nets and jug lines for selectively harvesting large alligator and longnose gar.

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## Methods

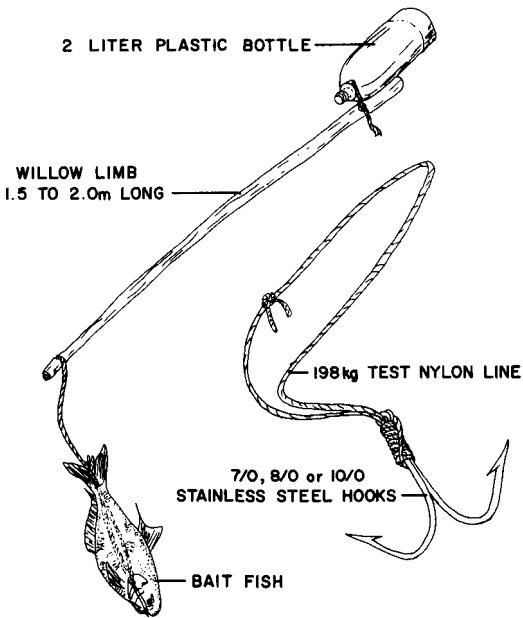
Sam Rayburn Reservoir (45,911 ha) was constructed by the U.S. Army Corps of Engineers in 1965 by impounding the Angelina River in Angelina and Jasper counties, Texas. It traditionally has supported sport fisheries for largemouth bass (*Micropterus salmoides*), crappie (*Pomoxis* spp), and sunfishes (*Lepomis* spp.) (Seidensticker 1983).

Multifilament gill nets and jug lines were fished concurrently for 20 nights, 10 each during September and October 1986. Water temperatures ranged from 20°–28°C. Sampling was started at the upper end of the reservoir and the sites were moved approximately 3 km each night until the entire impoundment was sampled. Time required to set, retrieve, and remove fishes from each gear type was determined.

Four sets of 6 multifilament nets (24 nets total) were set approximately 1 km apart within each sample site. Nets were 97 m long, 2.7 m deep and each net consisted of only 1 size mesh and twine. Bar mesh (with twine size) was 5.08 cm (No. 209), 7.62 cm (No. 209), 7.62 cm (No. 12), 10.16 cm (No. 9), 12.70 cm (No. 9) or 15.24 cm (No. 9). Nets, set at dusk and retrieved at dawn, were suspended approximately 1.5 m below the surface in the main body of the lake to avoid interference with boat traffic. All gar were measured to the nearest 2.5-cm group (total length), weighed to the nearest 0.5 kilogram, and recorded by mesh size. Other species were measured to the nearest mm (total length) and recorded by mesh size.

One hundred jug lines were fished each night in the same area as gill nets. A jug line consisted of a wooden pole approximately 1.5 to 2.0 m long with a 2-liter plastic bottle tied to one end and 1.0 m of 198-kg test nylon line with a double, stainless steel hook (7/0, 8/0 or 10/0) on the other end (Fig. 1). Jug lines were baited with dead fish primarily gizzard shad and white bass (TL 250–350 mm). The main line and hook were inserted through the bait fish from mouth to tail to prevent loss. Jug lines were set at dusk and retrieved at dawn. All fishes collected on jug lines were measured to the nearest 2.5-cm group (total length) and weighed to the nearest 0.5 kg. Common and scientific names used in this report are those reported by Robins et al. (1980). Gar lengths were partitioned into 2.5 cm groups by gear type and species. Length frequency and total catch were divided by man-hours required for each gear type to provide incremental and total catch per unit effort (CPUE).

Normality of length frequency and incremental CPUE data were tested using the SAS univariate procedure with the Shapiro-Wilk option for small sample sizes (SAS 1985). Length frequency and incremental CPUE data were not normally distributed. Transformations were unable to normalize data sufficiently to meet the assumptions of parametric statistical tests (Zar 1974); therefore, non-parametric equivalents were used. Total CPUE of each gar species and both species combined were tested for differences between gears using 2-sample Mann-Whitney tests. Median length of each gar by species and by gear were also tested using the 2-sample Mann-Whitney test. Significance was set for all statistical analysis at 5% ( $P \leq 0.05$ ).



**Figure 1.** Diagram of a typical jug line used to catch large gar, Sam Rayburn Reservoir, Texas.

## Results and Discussion

Two men required 1 hour to bait and set 100 jug lines and 4 hours to retrieve the jugs and gar the following morning. Three men each in 2 boats required 1 hour to set 24 gill nets and 3 hours the following morning to run the nets. Average effort required to fish 1 gill net overnight was 1 man-hour. This was the same effort required to fish 10 jug lines. Therefore, 1 unit of effort was equal to 1 gill net night or 10 jug line nights.

Jug lines were more efficient for catching large gar, especially alligator gar, than gill nets. Gill nets (particularly 5.08 cm mesh) had a higher catch of longnose gar than jug lines (Table 1). However, combined CPUE of longnose and alligator gar was significantly higher for jug lines than gill nets.

Median length of longnose gar caught by jug lines (Fig. 2) was significantly greater than for those caught by gill nets. There was no significant difference between median sizes of alligator gar caught by either method.

Gill nets were less selective than jug lines. Three blue catfish (mean weight 13.0 kg) were the only specimens other than gar caught on jug lines and could have been released alive. Combined mean CPUE in gill nets for sport, forage, and rough fishes was 12 times higher than that for gar catch. Even the 5.08-cm bar mesh webbing which had the highest individual CPUE for gar had an incidental catch of sport fishes 10 times higher than gar.

Based on these results, it would have taken a commercial fisherman 18.7 days fishing 50 jug lines/day to catch 100 gar, mainly large alligator gar, in Sam Rayburn

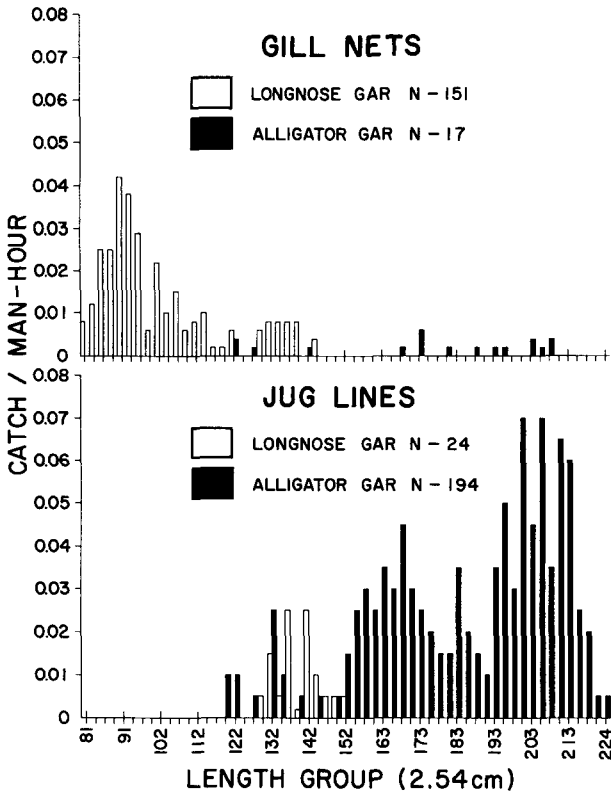
**Table 1.** Catch/man-hour for 2,000 jug lines and 480 gill nets (by individual mesh sizes and all sizes combined), Sam Rayburn Reservoir, Texas, September–October 1986. One man hour of effort was required to fish 1 gill net or 10 jug lines overnight.

Category	Jug lines	All mesh sizes	Gill nets (cm bar-mesh)					
			5.08	7.62	7.62	19.16	12.70	15.24
<b>Gar</b>								
Longnose	0.11	0.31	1.45	0.16	0.19	0.05	0.00	0.02
Alligator	0.96	0.04	0.10	0.00	0.00	0.04	0.06	0.01
Total gar	1.07	0.35	1.55	0.16	0.19	0.09	0.06	0.03
<b>Sport fishes</b>								
Blue catfish	<0.01	0.02	0.09	0.02	0.00	0.01	0.00	0.00
Channel catfish	0.00	0.15	0.79	0.08	0.00	0.01	0.00	0.00
Flathead catfish	0.00	<0.01	0.01	0.00	0.00	0.00	0.00	0.00
White bass	0.00	2.29	13.75	0.00	0.00	0.00	0.00	0.00
White x striped bass	0.00	0.08	0.16	0.25	0.04	0.00	0.00	0.00
Striped bass	0.00	<0.01	0.00	0.01	0.00	0.00	0.00	0.00
Redear sunfish	0.00	<0.01	0.01	0.00	0.00	0.00	0.00	0.00
Largemouth bass	0.00	0.01	0.08	0.0	0.00	0.00	0.00	0.00
White crappie	0.00	0.07	0.41	0.01	0.00	0.00	0.00	0.00
Black crappie <sup>1</sup>	0.00	0.02	0.14	0.00	0.00	0.00	0.00	0.00
<b>Forage fishes</b>								
Gizzard shad	0.00	1.20	7.19	0.00	0.00	0.00	0.00	0.00
<b>Rough fishes</b>								
Common carp	0.00	<0.01	0.00	0.00	0.00	0.05	0.00	0.00
Smallmouth buffalo	0.00	0.13	0.08	0.05	0.03	0.05	0.29	0.31
Bigmouth buffalo	0.00	<0.01	0.00	0.00	0.00	0.00	0.00	0.02
Freshwater drum	0.00	0.04	0.11	0.05	0.00	0.05	0.00	0.02
Total fishes	<0.01	4.09	23.08	0.49	0.07	0.23	0.34	0.37

Reservoir. Essentially, no other fish would have been caught. An equivalent effort with gill nets would have yielded only 33 gar, the gar would have been smaller, and there would have been an incidental catch of 396 other fish. Using an equal effort of the most efficient gill nets, a commercial fisherman would have caught 145 gar, mostly small longnose gar, and would have an incidental catch of 1,444 sport fish. Most of the sport fishes would have died (Seidensticker 1976) and been wasted. If large gar are abundant in a reservoir, a commercial jug line fishery would allow utilization of this resource with no adverse effect on sport fishes.

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**Figure 2.** Length distribution of alligator and longnose gar collected by multifilament gill nets and jug lines, Sam Rayburn Reservoir, Texas, September–October 1986. One man hour of effort was required to fish 1 gill net or 10 jug lines overnight.

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